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<b>(21) International Application Number:</b> PCT/US85/00804 <b>(22) International Filing Date:</b> 6 May 1985 (06.05.85) <b>(31) Priority Application Number:</b> 607,525 <b>(32) Priority Date:</b> 7 May 1984 (07.05.84) <b>(33) Priority Country:</b> US  <b>(71) Applicant:</b> SOUTHWEST RESEARCH INSTITUTE [US/US]; 6220 Culebra Road, San Antonio, TX 78284 (US). <b>(72) Inventors:</b> DEAN, Edward, E. ; 10306 Country Corner, San Antonio, TX 78245 (US). TOMLINSON, Samuel, J., Sr. ; 1106 Boling Brook, San Antonio, TX 78245 (US). <b>(74) Agent:</b> SIGALOS, John, L.; Sigalos & Levine, 1300 Republic Bank Tower, Dallas, TX 75201 (US).		<b>(81) Designated States:</b> AT (European patent), AU, BE (European patent), BR, CH (European patent), DE (European patent), DK, FI, FR (European patent), GB (European patent), IT (European patent), JP, LU (European patent), MC, NL (European patent), NO, SE (European patent).  <b>Published</b> <i>With international search report.</i>
<b>(54) Title:</b> STABLE OLFACTORY REPELLENT COMPOSITION, RESULTANT ARTICLES AND METHOD OF REPELLING PESTS USING SAID COMPOSITION  <b>(57) Abstract</b>  A stable olfactory repellent composition effective for repelling feral and domesticated animals consisting essentially of microcapsules comprising wormwood oil encapsulated by a material compatible with and impermeable to the oil but permeable to the vapors emitted by the oil; articles consisting of a fabricated object impregnated with or incorporating wormwood oil in an amount sufficient to repel; and the method of repelling comprising utilizing wormwood oil.		

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STABLE OLFACTORY REPELLENT COMPOSITION, RESULTANT  
ARTICLES AND METHOD OF REPELLING PESTS USING  
SAID COMPOSITION

BACKGROUND OF THE INVENTION

It is well known that rats, mice, squirrels,  
foxes raccoons, dogs, cats, and other feral  
and domesticated animals and pests cause damage  
5 to a variety of buried items, such as telephone  
wires and cables, as well as damage to shrubbery,  
gardens, packed articles of food, plastic arti-  
cles, clothing, and the like. A variety of  
techniques are used to either kill or repel  
10 such pests and while they are to varying degrees  
successful, they are either uniformly difficult  
to apply, or expensive, and/or in some instances  
toxic. Accordingly, they have met with mixed  
results.

15 In addition, it is difficult, if not impos-  
sible in some instances, to incorporate the  
repellent with, for example, plastic material  
used to form underground cable because of incom-  
patibility problems or because of lack of stabil-  
20 ity after being incorporated into the plastic  
material used to form a covering for the cables.

Consequently, there continues to be a  
significant economic cost due to pest damage  
to articles such as buried cables, wires, plants,  
25 food products and the like. Rats, for example,  
continue to damage a great deal of packaged

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stored food products, such as grains which are packaged in burlap bags.

#### SUMMARY OF THE INVENTION

A novel olfactory repellent composition, method of using the same, and articles impregnated with the same have now been found which repel feral and domesticated animals and other pests.

Briefly stated, the present invention comprises a stable olfactory repellent composition effective for repelling feral and domesticated animals consisting essentially of microcapsules comprising wormwood oil encapsulated by a material compatible with and impermeable to said oil but permeable to the vapors emitted by said oil.

The invention also comprises, as set forth more fully below, articles impregnated with or incorporating wormwood oil and the method of repelling animals comprising subjecting a surface from which the animals are to be repelled to the action of wormwood oil in an amount effective to repel.

#### DETAILED DESCRIPTION

While the instant invention is broadly applicable to repelling feral animals, as well

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as domestic animals, such as dogs, cats, and the like, and other pests, it will be described with particularity to rats and the items which they attack, such as wires, cables, and cloths.

5       As to the repellent per se, it is wormwood oil. Wormwood oil is obtained from the dried leaves and flower tops of Artemisia absinthium L., compositae. Such material is described in the Merck Index and it has been primarily  
10       used in the past as a flavoring in alcoholic beverages, such as vermouth and medically in the past as a bitter tonic and an anthelmintic. It has now been surprisingly found that this oil is an aversive stimulus to animals and  
15       other pests and will cause such pests to avoid an area, avoid digging in the area, and avoid items that they normally deem palatable. Moreover, the wormwood oil causes avoidance behavior in most circumstances and under widely varying  
20       conditions.

Equally importantly, while wormwood oil is offensive to pests, it is not unpleasant with respect to human olfaction. Thus, it can be used in circumstances where humans would  
25       be exposed to the odor of the product.

Another unexpected benefit of wormwood

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oil is that it is persistent in yielding the amount of vapor necessary to repel feral and domesticated animals. Equally importantly, wormwood is effective when mixed with latex carriers or other plastics, such as those used for coating metal wires and cables for surface or subsurface use.

Further, the wormwood oil can be encapsulated by any of the conventional microencapsulation techniques to form microcapsules which can then be dispersed over an area, such as a garden, to give long-term repelling action. The composition of the shell material can be 90/50 grade polyvinyl alcohol, grade HWG carageenan, mixtures thereof, or equivalent encapsulating material. The theoretical payload is 69.4% w/w and the range of capsule size is 250 to 850 microns in diameter. The vapor loss in ambient air for a six week period is only 2.6% at 78° F. to 82° F. and average relative humidity of 60%. There is little reason to suspect that vapor loss would be significantly greater at higher temperatures. Not only is the wormwood oil compatible with such encapsulating material, but the vapors thereof are permeable with respect thereto and can be emitted

from the capsules. Thus, the oil itself can be encapsulated, applied to an area to be protected as at the periphery of a vegetable plot or shrubs or the like or a storage facility  
5 for packaged food, and continue to emit its repellent odor for substantial periods of time.

It is believed that the wormwood oil would also act to protect domestic animals such as sheep and goats from attack from predators.  
10 It is known that such predators commonly and most usually kill goats and sheep by biting them in the neck and a number of articles are now proposed for use to be incorporated around the neck of such animals to protect them from  
15 attack. As set forth below, testing of the instant repellent composition against red foxes shows that it does repel the foxes and it is believed to repel such other feral animals, such as wolves and coyotes. By applying the  
20 repellent composition of the instant invention about the neck of domesticated animals, such as sheep or goats, or applying it to collars made of plastic and the like which are placed about the necks of such animals, it may act  
25 to prevent them from attack by feral predators.

As to amounts, depending upon the particular

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circumstances and the size of area to be treated, it has been found that as little as <1 g to 125 g of wormwood oil is effective to give an olfactory scent that is repellent to feral  
5 and domesticated animals, such as foxes, raccoons, opossums, gerbils, rats, dogs, cats, and the like. The particular amount for any given circumstance can be readily determined by routine experimentation.

10 The wormwood oil is also capable of being incorporated into articles in order to make them repellent to pests. For example, it can be mixed with natural and synthetic latex materials and other plastics used to make pipe  
15 or used to sheath underground cables and wires in amounts such as 10 percent by volume and will effectively thereafter keep pests such as rats from attacking the wire or cable so coated. In addition, such materials can be  
20 impregnated with the wormwood oil and actively repel pests.

Impregnation, however, is more satisfactory with cloth, such as cotton cloths used to cover articles.

25 The invention will be further described in connection with the examples which follow



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which are set forth for purposes of illustration only.

#### EXAMPLE 1

In a series of repetitive tests, strips  
5 of cloth (a 1 cm x 5 cm) were each impregnated  
with <0.5 g of wormwood oil and placed in cages  
housing gerbils together with strips of untreated  
cloth. The impregnated cloth strips remained  
intact while the untreated cloth strips were  
10 virtually pulverized.

#### EXAMPLE 2

Pieces of electrical cable, each 15 cm  
in length and having a latex cover, had adsorbed  
on the latex cover of each <1 g of wormwood  
15 oil. Such treated pieces were placed in cages  
with laboratory rats together with untreated  
pieces of cable. The rats attacked and frayed  
the untreated pieces of cable and exposed the  
conducting wire while the treated cable pieces  
20 remained intact.

#### EXAMPLE 3

A series of tests were run using animals  
that were normally fed ALPO. Some of the animals  
were first maintained on a deprivation diet  
25 (68% of their normal ration) and others had  
food withheld for 24 hours. Both groups then

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were given rations of ALPO which had been treated with 10 ml of wormwood oil or approximately 5 g of encapsulated wormwood oil. In all instances the animals did not ingest the treated

5 ALPO.

#### EXAMPLE 4

In pens housing foxes, backfilled holes were created and the foxes with apparent insatiable curiosity would react vigorously when

10 digging at these holes. However, these same foxes did not show any interest in digging at or exploring backfilled holes in which the dirt had been treated with 5 to 10 g of encapsulated wormwood oil.

#### EXAMPLE 5

15 Foxes, as well as other animals, were exposed to relative large excavations that were laced with 120 g of encapsulated wormwood oil. The animals avoid the same although they

20 ordinarily are attracted to and actively explore such excavation.

While the invention has been described in connection with a preferred embodiment, it is not intended to limit the scope of the

25 invention to the particular form set forth, but, on the contrary, it is intended to cover

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such alternatives, modifications, and equivalents as may be included within the spirit and scope of the invention as defined by the appended claims.

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## WHAT IS CLAIMED IS:

1. A stable olfactory repellent composition effective for repelling feral and domesticated animals consisting essentially of micro-  
5 capsules comprising wormwood oil encapsulated by a material compatible with and impermeable to said oil but permeable to the vapors emitted by said oil.

10 2. The composition of Claim 1 wherein the encapsulating material is 90/50 grade polyvinyl alcohol, grade HWG carrageenan, or mixtures thereof.

15 3. The article having an aversive stimulus to a feral or domesticated animal consisting essentially of a fabricated object impregnated with or incorporating wormwood oil in an amount sufficient to repel said animal.

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4. The article of Claim 3 wherein the fabricated object is selected from a coated metal wire or cable intended for surface or subsurface use.

25

5. The article of Claim 3 wherein the

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fabricated object is a cloth.

6. The article of Claim 3 wherein the wormwood oil is encapsulated by a material  
5 compatible with and impermeable to said oil but permeable to the vapors emitted by said oil.

7. A method for repelling a feral or  
10 domesticated animal comprising subjecting a surface or area from which said animal is to be repelled to the action of wormwood oil in an amount effective to repel said animal therefrom.

15

8. The method of Claim 6 wherein the wormwood oil is encapsulated by a material compatible with and impermeable to said oil but permeable to the vapors emitted by said  
20 oil.

9. A method for repelling a feral or domesticated animal from surface or subsurface coated wires or cables or plastic pipe comprising  
25 applying wormwood oil to said coated wires or cables or plastic pipe in an amount effective to repel said animal therefrom.

## INTERNATIONAL SEARCH REPORT

International Application No

PCT/US85/00804

**I. CLASSIFICATION OF SUBJECT MATTER** (If several classification symbols apply, indicate all) <sup>3</sup>According to International Patent Classification (IPC) or to both National Classification and IPC <sup>3</sup>

A01N/6500

514/920 424/29 514/195.1 514/963

**II. FIELDS SEARCHED**Minimum Documentation Searched <sup>4</sup>

Classification System

Classification Symbols

U.S.

424/29 514/195.1 514/92

Documentation Searched other than Minimum Documentation  
to the Extent that such Documents are Included in the Fields Searched <sup>5</sup>**CHEMICAL ABSTRACTS****III. DOCUMENTS CONSIDERED TO BE RELEVANT** <sup>14</sup>

Category <sup>6</sup>	Citation of Document, <sup>15</sup> with indication, where appropriate, of the relevant passages <sup>17</sup>	Relevant to Claim No. <sup>18</sup>
Y	U.S., A, 279,852 Atkins 19 June 1883	3 to 5 7, 9
Y	U.S., A, 628,681 Valentine 11 July 1899	1,2
Y	U.S., A, 3,516,941 Matson 23 June 1970	1 to 3, 6
Y	U.S., A, 3,567,119 Wilbert 2 March 1971	1 to 3, 6
Y	U.S., A, 3,434,995 Shotton 25 March 1969	4,9
Y	U.S., A, 3,448,586 Mailen 10 June 1969	4,9
Y	FR. A 1,467,300 Abic 27 January 1967	3,5
Y	Chem. Abstracts <u>70</u> # 27717w(1969)Fed. Regist.	1 to 3, 6
Y	Chem. Abstracts <u>92</u> # 89296w(1980) Palmeri	1 to 3,7,8
Y	Chem. Abstracts <u>94</u> # 97975y(1981) Galun	1 to 3,7,8
Y	Chem. Abstracts <u>79</u> # 1332c(1973) Cornwell	1 to 3,7,8

<sup>6</sup> Special categories of cited documents: <sup>16</sup><sup>"A"</sup> document defining the general state of the art which is not considered to be of particular relevance<sup>"E"</sup> earlier document but published on or after the international filing date<sup>"L"</sup> document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)<sup>"O"</sup> document referring to an oral disclosure, use, exhibition or other means<sup>"P"</sup> document published prior to the international filing date but later than the priority date claimed<sup>"T"</sup> later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention<sup>"X"</sup> document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step<sup>"Y"</sup> document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.<sup>"A"</sup> document member of the same patent family**IV. CERTIFICATION**Date of the Actual Completion of the International Search <sup>2</sup>

18 July 1985

Date of Mailing of this International Search Report <sup>2</sup>

25 JUL 1985

International Searching Authority <sup>1</sup>

ISA/US

Signature of Authorized Officer <sup>10</sup>

Shep K. Rose

## FURTHER INFORMATION CONTINUED FROM THE SECOND SHEET

Y	Chem. Abstracts <u>81</u> #73455j(1974) Rebstock	1 to 3,7,8
Y	Chem. Abstracts <u>83</u> # 109484a(1975) Khan	3,7
Y	Chem. Abstracts <u>95</u> # 76930k(1981) Jermy	3,7
Y	Chem. Abstracts <u>74</u> # 93337d(1971) Wada	3,7
Y	Chem. Abstracts <u>88</u> # 118675u(1978) Scholl	7
Y	Chem. Abstracts <u>85</u> # 105032v(1976) Johnson	7
Y	Chem. Abstracts <u>63</u> # 1667e(1965) Aichner	7
Y	Chem. Abstracts <u>86</u> # 104150r(1977) Makarova	7

V. ☒ OBSERVATIONS WHERE CERTAIN CLAIMS WERE FOUND UNSEARCHABLE <sup>10</sup>

This International search report has not been established in respect of certain claims under Article 17(2) (a) for the following reasons:

1. ☐ Claim numbers ..... because they relate to subject matter <sup>12</sup> not required to be searched by this Authority, namely:

2. ☒ Claim numbers 8 ..... because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out <sup>13</sup>, specifically:

Claim 8 is dependent on method of claim 6, but claim 6 is an article not a method

VI. ☐ OBSERVATIONS WHERE UNITY OF INVENTION IS LACKING <sup>11</sup>

This International Searching Authority found multiple inventions in this international application as follows:

1. ☐ As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims of the international application.
2. ☐ As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims of the international application for which fees were paid, specifically claims:
3. ☐ No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claim numbers:
4. ☐ As all searchable claims could be searched without effort justifying an additional fee, the International Searching Authority did not invite payment of any additional fee.

Remark on Protest

- ☐ The additional search fees were accompanied by applicant's protest.
- ☐ No protest accompanied the payment of additional search fees.